**CLAIMS**

What is claimed is:

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1. A diffraction grating for diffracting optical signals, comprising:

a substrate; and

a layer of material having a first surface adjacent the substrate and a second surface, the layer of material having a grating profile designed to diffract one or more input optical signals as one or more output optical signals over a wavelength range of at least about 30nm, within which the diffraction grating is substantially polarization insensitive.

2. The diffraction grating of claim 1, wherein:

the one or more input optical signals incident on the layer of material includes a polychromatic signal.

3. The diffraction grating of claim 1, wherein:

the one or more input optical signals incident on the reflective material includes a plurality of narrowband optical signals.



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4. The diffraction grating of claim 1, wherein:

the one or more input optical signals comprises a polychromatic signal incident on the second surface of the layer of material; and

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the one or more output optical signals comprising at least two demultiplexed narrowband optical signals.

5. The diffraction grating of claim 1, wherein:

the one or more input optical signals comprises a plurality of narrowband optical signals incident on the second surface of the layer of material; and

the one or more output optical signals forming a multiplexed polychromatic signal.

6. The diffraction grating of claim 1, wherein:

the output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 60% of the power of a corresponding transverse electric and transverse

magnetic polarization state of the one or more input optical signals, respectively.

7. The diffraction grating of claim 1, wherein:

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the diffraction grating has an efficiency of at least 60% over the wavelength range.

8. The diffraction grating of claim 1, wherein:

the output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 80% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

9. The diffraction grating of claim 1, wherein:

the diffraction grating has an efficiency of at least 80% over the wavelength range.

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10. The diffraction grating of claim 1, wherein:

the wavelength range includes at least one of the C-band and L-Band wavelength ranges;

the output optical signals include transverse electric and transverse magnetic polarization states; and

the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to the power level of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, are substantially equal at one or more wavelengths approximately in the wavelength range.

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11. The diffraction grating of claim 1, wherein: the output optical signals include transverse electric and transverse magnetic polarization states; and for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to the power level of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 20% loss.

12. The diffraction grating of claim 1, wherein: the output optical signals include transverse electric and transverse magnetic polarization states; and for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to the power level of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 10% loss.

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13. The diffraction grating of claim 1, wherein: the wavelength range includes at least one of the C-band and L-band wavelength ranges.

14. The diffraction grating of claim 1, wherein: the number of output optical signals is at least 8.

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15. A method of communicating optical signals, comprising:

receiving one or more input optical signals; and

diffracting the one or more input optical signals into one or more output optical signals over a wavelength range of at least 30nm, polarization states for the one or more output optical signals having power levels that are substantially the same as the power levels of corresponding polarization states of the one or more input optical signals.

16. The method of claim 15, wherein:

the output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 60% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

17. The method of claim 15, wherein:

the efficiency of the diffracting of the one or more input optical signals is at least 60% over the wavelength range.

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18. The method of claim 15, wherein:

the output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 80% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals over.

19. The method of claim 15, wherein:

the efficiency of the diffracting of the one or more input optical signals is at least 80% over the wavelength range.

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20. The method of claim 16, wherein:

the wavelength range includes at least one of the C-band and L-band wavelength ranges;

the output optical signals include transverse electric and transverse magnetic polarization states; and

the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, are substantially equal at one or more wavelengths approximately within the wavelength range.

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21. The method of claim 15, wherein:

the output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to the power level of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 20% loss.

22. The method of claim 15, wherein:

the output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the of the transverse electric polarization state and the loss of the transverse magnetic polarization state of the output optical signals, relative to the power level of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 10%.

23. The method of claim 15, wherein:

the wavelength range includes at least one of the C-band and L-band wavelength ranges.

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24. The method of claim 15, wherein:

the one or more output optical signals comprise at least 8 output optical signals.

25. A diffraction grating, comprising:

a substrate; and

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means, associated with the substrate, for receiving one or more input optical signals directed towards the substrate and diffracting the one or more input optical signals into one or more output optical signals over a wavelength range of at least 30nm, the diffraction grating being substantially polarization insensitive over the wavelength range.

26. The diffraction grating of claim 25, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 60% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

27. The diffraction grating of claim 25, wherein:

the diffraction grating has an efficiency of at least 60% over the wavelength range.

28. The diffraction grating of claim 25, wherein:

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the one or more output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 80% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

29. The diffraction grating of claim 25, wherein:

the diffraction grating has an efficiency of at least 80% over the wavelength range.

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30. The diffraction grating of claim 25, wherein:

the wavelength range includes at least one of the C-band and L-Band wavelength ranges;

the output optical signals include transverse electric and transverse magnetic polarization states; and

the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to the power of the transverse electric and transverse magnetic polarization states, respectively, of the one or more input optical signals are equal at one or more wavelengths approximately within the wavelength range.

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31. The diffraction grating of claim 25, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to the power of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 20% loss.

32. The diffraction grating of claim 25, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to the power of the transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 10% loss.

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33. The diffraction grating of claim 25, wherein: the wavelength range includes at least one of the C-band and L-Band wavelength ranges.

34. The diffraction grating of claim 25, wherein: the diffraction grating is capable of diffracting at least 8 output optical signals over the wavelength range.

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35. A diffraction grating, comprising:

a reflective material having a blazed surface with a blaze angle between about 27 degrees and about 39 degrees; and

an optically transmissive material disposed adjacent the reflective material and having an index of refraction (n), wherein the blazed surface of the reflective material has approximately (500±110)*n number of grooves per millimeter.

36. The diffraction grating of claim 35, wherein:

the number of grooves per millimeter for the reflective material is between about 710 and about 790;

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64; and

the blaze angle is between about 27 and about 32 degrees.

37. The diffraction grating of claim 35, wherein:

the diffraction order associated with the lowest loss is the first order.

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38. The diffraction grating of claim 35, wherein:

the number of grooves per millimeter for the reflective material is between about 850 and about 950;

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64; and

the blaze angle is between about 31 and about 34 degrees.

39. The diffraction grating of claim 35, further comprising:

the number of grooves per millimeter for the reflective material is between about 950 and about 1050;

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64; and

the blaze angle is between about 34 and about 39 degrees.

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40. A diffraction grating, comprising:

a reflective material having a sinusoidal surface; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the sinusoidal surface of the reflective material has a groove depth of approximately (500±110)*n in nanometers and approximately (685±40)/n number of grooves.

41. The diffraction grating of claim 40, wherein:

the number of grooves per millimeter for the reflective material is between about 700 and about 800; and

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64.

42. The diffraction grating of claim 40, wherein:

the groove depth for the reflective material is between about 420 and about 470; and

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64.

43. The diffraction grating of claim 40, wherein: the diffraction order associated with the lowest loss is the first order.

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44. The diffraction grating of claim 40, wherein: the reflective material is at least one of the following: gold material, aluminum material and silver material.

45. The diffraction grating of claim 40, further comprising: a substantially planar substrate on which the reflective material is formed.

46. A diffraction grating, comprising:

a reflective material having a blazed surface with a blaze angle between about 37 degrees and about 40 degrees; and

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an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the blazed surface of the reflective material has approximately (200±40)*n number of grooves per millimeter.

47. The diffraction grating of claim 46, wherein:

the number of grooves per millimeter for the reflective material is between about 260 and about 340; and

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64.

48. The diffraction grating of claim 46, wherein:

the diffraction order associated with the lowest loss is the fourth order.

49. The diffraction grating of claim 46, wherein:

the reflective material is at least one of the following: gold material, aluminum material and silver material.

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50. The diffraction grating of claim 46, further comprising: a substantially planar substrate on which the reflective material is formed.

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51. A diffraction grating, comprising:

a reflective material having a blazed surface with a blaze angle between about 41 degrees and about 44 degrees; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the blazed surface of the reflective material has approximately (450±40)*n number of grooves per millimeter.

52. The diffraction grating of claim 51, wherein:

the number of grooves per millimeter for the reflective material is between about 560 and about 640; and

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64.

53. The diffraction grating of claim 51, wherein:

the diffraction order associated with the lowest loss is the second order.

54. The diffraction grating of claim 51, wherein:

the reflective material is at least one of the following: gold material, aluminum material and silver material.

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55. The diffraction grating of claim 51, further comprising: a substantially planar substrate on which the reflective material is formed.

56. A diffraction grating, comprising:

a reflective material having a blazed surface with a blaze angle between about 68 degrees and about 76 degrees; and

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an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the blazed surface has approximately (200±20)*n number of grooves per millimeter.

57. The diffraction grating of claim 56, wherein:

the number of grooves per millimeter for the reflective material is between about 180 and about 220; and

the index of refraction of the optically transmissive material is approximately 1.0.

58. The diffraction grating of claim 56, wherein:

the diffraction order associated with the lowest loss is the fifth order.

59. The diffraction grating of claim 56, wherein:

the reflective material is at least one of the following: gold material, aluminum material and silver material.

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60. The diffraction grating of claim 56, further comprising:

a substantially planar substrate on which the reflective material is formed.

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61. A diffraction grating, comprising:

a reflective material having a blazed surface with a blaze angle between about 50 degrees and about 56 degrees; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the blazed surface of the reflective material has approximately (250±30)*n number of grooves per millimeter.

62. The diffraction grating of claim 61, wherein:

the number of grooves per millimeter for the reflective material is between about 220 and about 280; and

the index of refraction of the optically transmissive material is approximately 1.0.

63. The diffraction grating of claim 61, wherein:

the diffraction order associated with the lowest loss is the fourth order.

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64. The diffraction grating of claim 61, wherein:

the reflective material is at least one of the following: gold material, aluminum material and silver material.

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~~65. A wavelength division device, comprising:~~

~~a plurality of first coupling components for supporting a plurality of a signal carrier;~~

~~a second coupling component disposed adjacent at least one of the first coupling components for supporting a signal carrier; and~~

~~a diffraction grating disposed relative to and in optical communication with signal carriers coupled to the first and second coupling components so as to diffract one or more input optical rays within the wavelength division device as a plurality of output optical rays for emission from the wavelength division device over a wavelength range of at least approximately 30nm, within the wavelength range the wavelength division device is substantially polarization insensitive.~~

66. The wavelength division device of claim 65, wherein: the one or more input optical signals comprises at least one polychromatic signal;

the one or more output optical signals comprises a plurality of narrowband optical signals; and

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the wavelength division device performs a wavelength division demultiplexing operation.

67. The wavelength division device of claim 65, wherein: the one or more input optical signals comprises a plurality of narrowband optical signals;

the one or more output optical signals emitted from the wavelength division device comprises a polychromatic signal; and

the wavelength division device performs a wavelength division multiplexing operation.

68. The wavelength division device of claim 65, wherein: the wavelength division device has a polarization dependent loss of less than approximately 1 dB over the wavelength range.

69. The wavelength division device of claim 65, wherein: the wavelength division device has a polarization dependent loss of less than approximately 0.5 dB over the wavelength range.

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70. The wavelength division device of claim 65, wherein: the number of output optical rays comprise at least 8.

71. The wavelength division device of claim 65, wherein: the diffracted output optical rays include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 60% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

72. The wavelength division device of claim 65, wherein: the diffraction grating has an efficiency of at least 60% over the wavelength range.

73. The wavelength division device of claim 65, wherein: the diffracted output optical rays include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 80% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical rays.

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74. The wavelength division device of claim 65, wherein: the diffraction grating has an efficiency of at least 80% over the wavelength range.

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75. The wavelength division device of claim 65, wherein:

the wavelength range includes at least one of the C-band wavelength range and the L-band wavelength range;

the diffracted output optical rays include transverse electric and transverse magnetic polarization states; and

the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states, respectively, of the one or more input optical signals are substantially equal at one or more wavelengths approximately within the wavelength range.

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76. The wavelength division device of claim 65, wherein:

the diffracted output optical rays include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states, respectively, of the one or more input optical signals is less than approximately 20% loss.

77. The wavelength division device of claim 65, wherein:

the diffracted output optical rays include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states, respectively, of the one or more input optical signals is less than approximately 10% loss.

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78. The wavelength division device of claim 65, wherein: the wavelength range includes at least one of the C-band and L-band wavelength ranges.

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79. A method of performing an operation on an optical signal, comprising:

receiving one or more input optical signals;

diffracting the one or more input optical signals into a plurality of output optical signals, each output optical signal having a distinct wavelength and being diffracted at a distinct angle within a wavelength range of at least 30nm and having polarization states whose power levels are substantially the same as power levels of corresponding polarization states of the one or more input optical signals; and

coupling each output optical signal onto a distinct carrier.

80. The method of claim 79, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 60% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

81. The method of claim 79, wherein:

the efficiency of the diffracting of the one or more input optical signals is at least 60% over the wavelength range.

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82. The method of claim 79, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 80% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

83. The method of claim 79, wherein:

the efficiency of the diffracting of the one or more input optical signals is at least 80% over the wavelength range.

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84. The method of claim 79, wherein:

the wavelength range includes at least one of the C-band and L-band wavelength ranges;

the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, are substantially equal at one or more wavelengths approximately within the wavelength range.

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85. The method of claim 79, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 20%.

86. The method of claim 79, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 10%.

87. The method of claim 79, wherein:

the wavelength range includes at least one of the C-band and L-band wavelength ranges.

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88. The method of claim 79, further comprising:

collimating the diffracted output optical signals.

89. The method of claim 79, wherein the diffracting comprises:

diffracting the one or more input optical signals into at least 8 output optical signals.

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90. A wavelength division device, comprising:

a means for receiving one or more input optical signals;

a means for diffracting the one or more input optical signals into a plurality of output optical signals, each output optical signal having a distinct wavelength and being diffracted at a distinct angle within a wavelength range of at least 30nm and having polarization states whose power levels are substantially the same as power levels of polarization states of a corresponding one of the one or more input optical signals; and

a means for coupling each output optical signal onto a distinct carrier.

91. The wavelength division device of claim 90, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 60% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

92. The wavelength division device of claim 90, wherein: the efficiency of the diffracting of the one or more input optical signals is at least 60% over the wavelength range.

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93. The wavelength division device of claim 90, wherein: the one or more output optical signals include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 80% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical signals.

94. The wavelength division device of claim 90, wherein: the efficiency of the diffracting of the one or more input optical signals is at least 80% over the wavelength range.

95. The wavelength division device of claim 90, wherein:

the wavelength range includes at least one of the C-band and L-band wavelength ranges;

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the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states, respectively, of the one or more input optical signals are substantially equal at one or more wavelengths approximately within the wavelength range.

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96. The wavelength division device of claim 90, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 20%.

97. The wavelength division device of claim 90, wherein:

the one or more output optical signals include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to power levels of corresponding transverse electric and transverse magnetic polarization states of the one or more input optical signals, respectively, is less than approximately 10%.

98. The wavelength division device of claim 90, wherein: the wavelength range includes at least one of the C-band and L-band wavelength ranges.

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99. The wavelength division device of claim 90, wherein: the number of output optical signals is at least 8.

100. The wavelength division device of claim 90, further comprising:

a means for collimating the diffracted output optical signals.

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101. A wavelength division device, comprising:

a plurality of first coupling components, each first component being capable of receiving a distinct carrier for carrying a signal;

a second coupling component disposed adjacent the first coupling components and capable of receiving a distinct carrier for carrying one or more signals; and

a diffraction grating optically coupled to each carrier received by the first and second coupling components, comprising:

a blazed reflective material having a number of grooves per millimeter and a blazed angle between about 27 degrees and about 39 degrees; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the number of grooves is approximately equal to (500±110)*n.

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102. The wavelength division device of claim 101, wherein:

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64;

the number of grooves per millimeter on the diffraction grating is between about 710 and about 790; and

the blaze angle is between about 27 degrees and about 32 degrees.

103. The wavelength division device of claim 101, wherein:, wherein:

the diffraction order associated with the lowest loss is the first order.

104. The wavelength division device of claim 101, wherein:

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64;

the number of grooves per millimeter on the diffraction grating is between about 850 and about 950; and

the blaze angle is between about 32 degrees and about 34 degrees.

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105. The wavelength division device of claim 101, wherein:

the index of refraction of the optically transmissive material is between about 1.44 and about 1.64;

the number of grooves per millimeter on the diffraction grating is between about 950 and about 1050; and

the blaze angle is between about 34 degrees and about 39 degrees.

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106. A wavelength division device, comprising:

a plurality of first coupling components, each first component being capable of receiving a distinct carrier for carrying a signal;

a second coupling component disposed adjacent the first coupling components and capable of receiving a distinct carrier for carrying one or more signals; and

a diffraction grating optically coupled to each carrier received by the first and second coupling components, comprising:

a reflective material with a sinusoidal surface having a number of grooves per millimeter and a groove depth in nm; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the number of grooves is approximately equal to (500±110)*n and the groove depth is approximately (685±40)/n.

107. The wavelength division device of claim 106, wherein:

the index of refraction of the optically transmissive material is between about 1.44 and 1.64; and

the reflective material of the diffraction grating has a groove depth between about 420nm and about 470nm.

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108. The wavelength division device of claim 106, wherein:

the diffraction order associated with the lowest loss is the first order.

109. The wavelength division device of claim 106, wherein:

the reflective material of the diffraction grating is at least one of the following: gold material, aluminum material and silver material.

110. The wavelength division device of claim 106, wherein:

the diffraction grating includes a substantially planar substrate on which the reflective material is disposed.

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111. The wavelength division device of claim 106, wherein: the index of refraction is between about 1.44 and 1.64; and the number of grooves per millimeter is between about 700 and about 800.

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112. A wavelength division device, comprising:

a plurality of first coupling components, each first component being capable of receiving a distinct carrier for carrying a signal;

a second coupling component disposed adjacent the first coupling components and capable of receiving a distinct carrier for carrying one or more signals; and

a diffraction grating optically coupled to each carrier received by the first and second coupling components, comprising:

a blazed reflective material having a number of grooves per millimeter and a blaze angle between about thirty-seven and about forty degrees; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the number of grooves is approximately equal to (200±40)*n.

113. The wavelength division device of claim 112, wherein: the diffraction order associated with the lowest loss is the fourth order.

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114. The wavelength division device of claim 112, wherein: the reflective material comprises at least one of the following materials: gold material, aluminum material and silver material.

115. The wavelength division device of claim 112, wherein: the index of refraction is between about 1.44 and about 1.64; and

the number of grooves per millimeter of the diffraction grating is between about 260 and about 340.

116. The wavelength division device of claim 112, wherein: the diffraction grating includes a substantially planar substrate.

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117. A wavelength division device, comprising:

a plurality of first coupling components, each first component being capable of receiving a distinct carrier for carrying a signal;

a second coupling component disposed adjacent the first coupling components and capable of receiving a distinct carrier for carrying one or more signals; and

a diffraction grating optically coupled to each carrier received by the first and second coupling components, comprising:

a blazed reflective material having a number of grooves per millimeter and a blaze angle between about forty-one and about forty-four degrees; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the number of grooves is approximately equal to (450±40)*n.

118. The wavelength division device of claim 117, wherein: the diffraction order associated with the lowest loss is the second order.

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119. The wavelength division device of claim 117, wherein: the reflective material of the diffraction grating comprises at least one of the following materials: gold material, silver material and aluminum material.

120. The wavelength division device of claim 117, wherein: the index of refraction is between about 1.44 and about 1.64; and

the number of grooves per millimeter on the diffraction grating is between about 560 and about 640.

121. The wavelength division device of claim 117, wherein: the diffraction grating includes a substantially planar substrate.

122. A wavelength division device, comprising:

a plurality of first coupling components, each first component being capable of receiving a distinct carrier for carrying a signal;

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a second coupling component disposed adjacent the first coupling components and capable of receiving a distinct carrier for carrying one or more signals; and

a diffraction grating optically coupled to each carrier received by the first and second coupling components, comprising:

a blazed reflective material having a number of grooves per millimeter and a blaze angle between about sixty-eight and about seventy-six degrees; and

an optically transmissive material disposed adjacent the reflective material having an index of refraction (n), wherein the number of grooves is approximately equal to (200±20)*n.

123. The wavelength division device of claim 122, wherein:

the diffraction order associated with the lowest loss is the fifth order.

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~~124. The wavelength division device of claim 122, wherein: the reflective material of the diffraction grating comprises at least one of the following materials: gold material, aluminum material and silver material.~~

~~125. The wavelength division device of claim 122, wherein: the index of refraction is approximately one; and the number of grooves per millimeter appearing on the diffraction grating is between about 180 and about 220.~~

~~126. The wavelength division device of claim 122, wherein: the diffraction grating includes a substantially planar substrate.~~

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127. A wavelength division device, comprising:

a plurality of first coupling components, each first component being capable of receiving a distinct carrier for carrying a signal;

a second coupling component disposed adjacent the first coupling components and capable of receiving a distinct carrier for carrying one or more signals; and

a diffraction grating optically coupled to each carrier received by the first and second coupling components, comprising:

a blazed reflective material having a blazed surface with a blaze angle between about fifty and about fifty-six degrees; and

an optically transmissive material disposed substantially adjacent the reflective material having an index of refraction, the reflective material having a number of grooves per millimeter being within a range approximately defined by the equation $(250\pm30)*n$, wherein n is the index of refraction of the optically transmissive material.

128. The wavelength division device of claim 127, wherein: the diffraction order associated with the lowest loss is the fourth order.

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129. The wavelength division device of claim 127, wherein: the reflective material of the diffraction grating comprises at least one of the following materials: gold material, aluminum material and silver material.

130. The wavelength division device of claim 127, wherein: the diffraction grating includes a substantially planar substrate.

131. The wavelength division device of claim 127, wherein: the index of refraction of the optically transmissive material is approximately one; and

the number of grooves per millimeter appearing on the diffraction grating is between about 220 and about 280.

132. A communications system utilizing optical communication, comprising:

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a plurality of carriers; and

a wavelength division device, comprising:

a plurality of first coupling components, each first component coupling a distinct carrier for carrying at least one signal within the wavelength division device;

a second coupling component disposed adjacent the first coupling components and coupling a distinct carrier for carrying one or more signals within the wavelength division device; and

a diffraction grating disposed relative to and in optical communication with the carriers coupled to the first and second coupling components so as to diffract one or more input optical rays as a plurality of output optical rays over a wavelength range of at least approximately 30nm, within the wavelength range the wavelength division device is substantially polarization insensitive.

133. The communications system of claim 132, wherein:

the wavelength division device has a polarization dependent loss of less than approximately 1 dB over the wavelength range.

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134. The communications system of claim 132, wherein:

the wavelength division device has a polarization dependent loss of less than approximately 0.5 dB over the wavelength range.

135. The communications system of claim 132, wherein the WDM device further comprises:

a collimating lens assembly disposed between the first and second coupling components and the diffraction grating so as to collimate output optical rays emitted from the carriers coupled to the first components.

136. The communications system of claim 132, wherein: the output optical rays include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 60% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical rays.

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137. The communications system of claim 132, wherein: the diffraction grating has an efficiency of at least 60% over the wavelength range.

138. The communications system of claim 132, wherein: the output optical rays include transverse electric and transverse magnetic polarization states, each transverse electric and transverse magnetic polarization state having at least 80% of the power of a corresponding transverse electric and transverse magnetic polarization state, respectively, of the one or more input optical rays.

139. The communications system of claim 132, wherein:

the diffraction grating has an efficiency of at least 80% over the wavelength range.

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140. The communications system of claim 132, wherein:

the wavelength range includes at least one of the C-band and L-band wavelength ranges.

141. The communications system of claim 132, wherein:

the output optical rays include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to corresponding transverse electric and transverse magnetic polarization states of the one or more optic rays, respectively, is less than approximately 20% loss.

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142. The communications system of claim 132, wherein:

the output optical rays include transverse electric and transverse magnetic polarization states; and

for each output optical signal, the difference between the loss of the transverse electric polarization state and the loss of the transverse magnetic polarization state, relative to corresponding transverse electric and transverse magnetic polarization states of the one or more optic rays, respectively, is less than approximately 10% loss.

143. The communications system of claim 132, wherein:

the number of output optical rays is at least 8.

144. The communications system of claim 132, wherein:

the one or more input optical signals comprises at least one polychromatic signal;

the one or more output optical signals comprises a plurality of narrowband optical signals; and

the wavelength division device performs an optical demultiplexing operation.

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145. The communications system of claim 132, wherein:

the one or more input optical signals comprises a plurality of narrowband optical signals;

the one or more output optical signals emitted from the wavelength division device comprises a polychromatic signal; and

the wavelength division device performs an optical multiplexing operation.